



INTRA-TESTICULAR NITRIC OXIDE REGULATES STEROIDOGENESIS IN FISH

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The entire reproductive events of fishes are primarily controlled by hormones secreted from hypothalmo-hypophysial-gonadal axis. Varieties of neuro-peptides and neuro-secretions from the hypothalamus stimulate pituitary to secrete tropic hormones, gonadotropin (GtHs) in particular, which induce the production of sex steroids like estrogens and progestogens in female and androgens in male, regulating ultimately the various reproductive events. In past decade, researches in mammals, however, have provided enough evidences that some factors, produced locally in gonads, influence the reproductive activity greatly. These local factors not only control reproduction directly, but also modulate the action of endocrine hormones delivered to gonads from the hypothalmo-hypophysial axis. Such factors include cytokines, growth factors, regulatory peptides, reactive oxygen and nitrogen species. These factors are synthesized and released by a variety of testicular and ovarian cells; such as Leydig, Sertoli, peritubular cells, macrophages, granulosa cell, thecal cells and germ cells, influencing steroidogenesis, follicular development, germ cell maturation, ovulation and many other reproductive processes. One of such intra-gonadal factor is nitric oxide (NO). NO, a highly versatile gaseous signaling molecule is reported to regulate diverse physiological functions such as secretion of hormones, immune response, reproductive activity, etc. It is produced from L-arginine by catalytic actions of one of the three isoforms of nitric oxide synthase (NOS): neuronal

(nNOS), endothelial (eNOS) and inducible (iNOS) in a variety of tissues. NO has been recognized as an important inter- and intra-cellular modulator of testicular steroidogenesis in higher vertebrates with conflicting results.

Moreover, its role in regulation of testicular steroidogenesis in ectothermic vertebrates is non-existent. Understanding the role of NO in Leydig cell steroidogenesis in teleost is highly essential, as the NO is implicated in stress-response and fishes are often subjected to variety of environmental and chemical stressors leading to reproductive dysfunction and gonadal steroidogenesis. Therefore, attempts were made to examine whether testis, particularly Leydig cells and testicular macrophages of a fresh water catfish, *Clarias batrachus* produce NO, if so, does it regulate its steroidogenesis activity? Are Leydig cells sensitive to exogenous/paracrine NO? What are the probable endocrine factors that regulate testicular NO production? Series of *in vitro* experiments performed suggest that fish testis is equipped with NOS system and is capable of producing NO and its production is under endocrine inhibitory control. Cellular sources of NO in the testis of the catfish are numerous like germ cell, Leydig cell as well as macrophages. Expression of NOS exhibits seasonality and depends of reproductive status of fish. Leydig cells are also highly sensitive to chemical as well as biological NO (released by macrophages). NO inhibits testosterone production by Leydig cells *in vitro*.